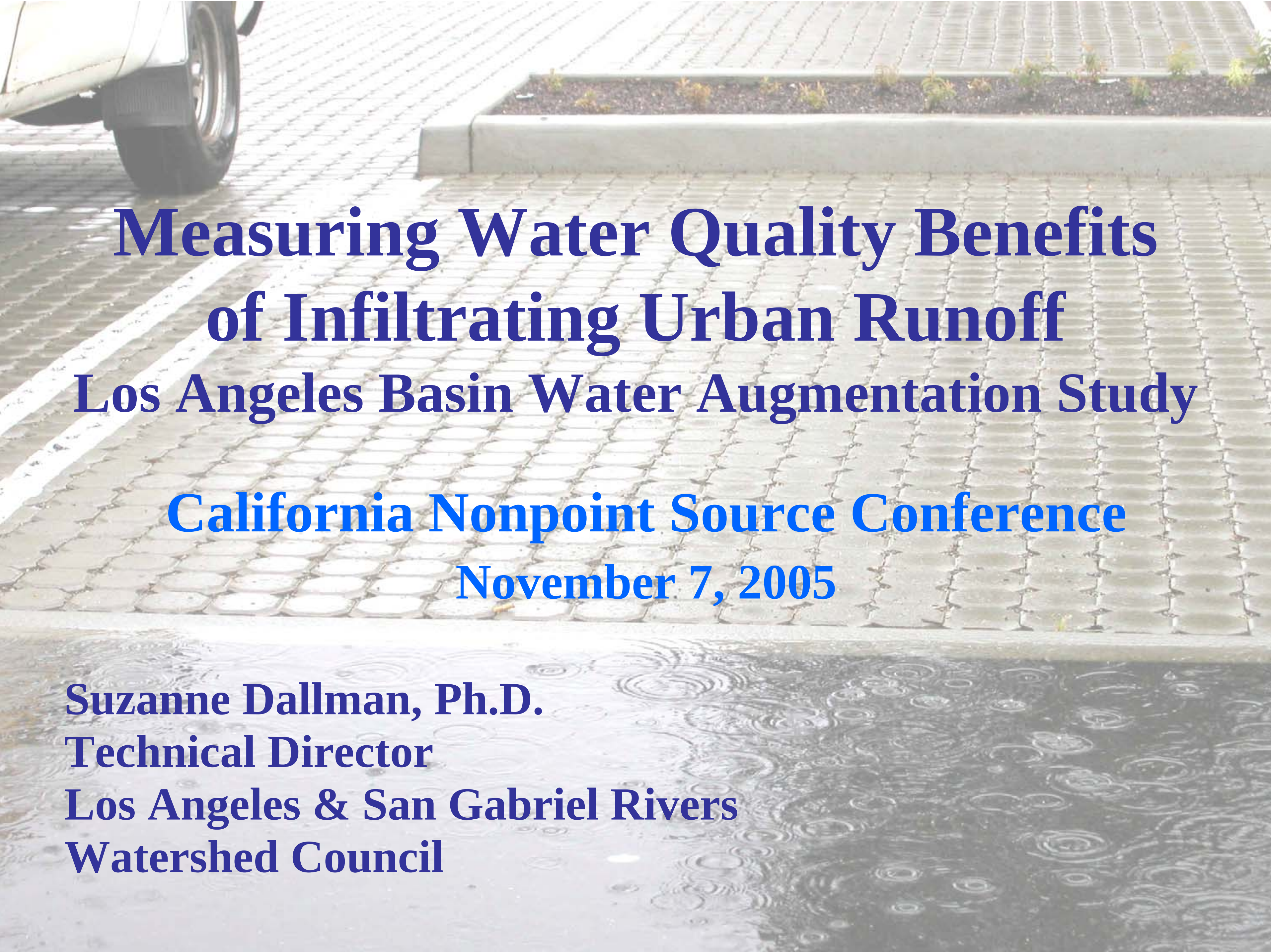

Measuring Water Quality Benefits of Infiltrating Urban Runoff

Los Angeles Basin Water Augmentation Study

California Nonpoint Source Conference

November 7, 2005

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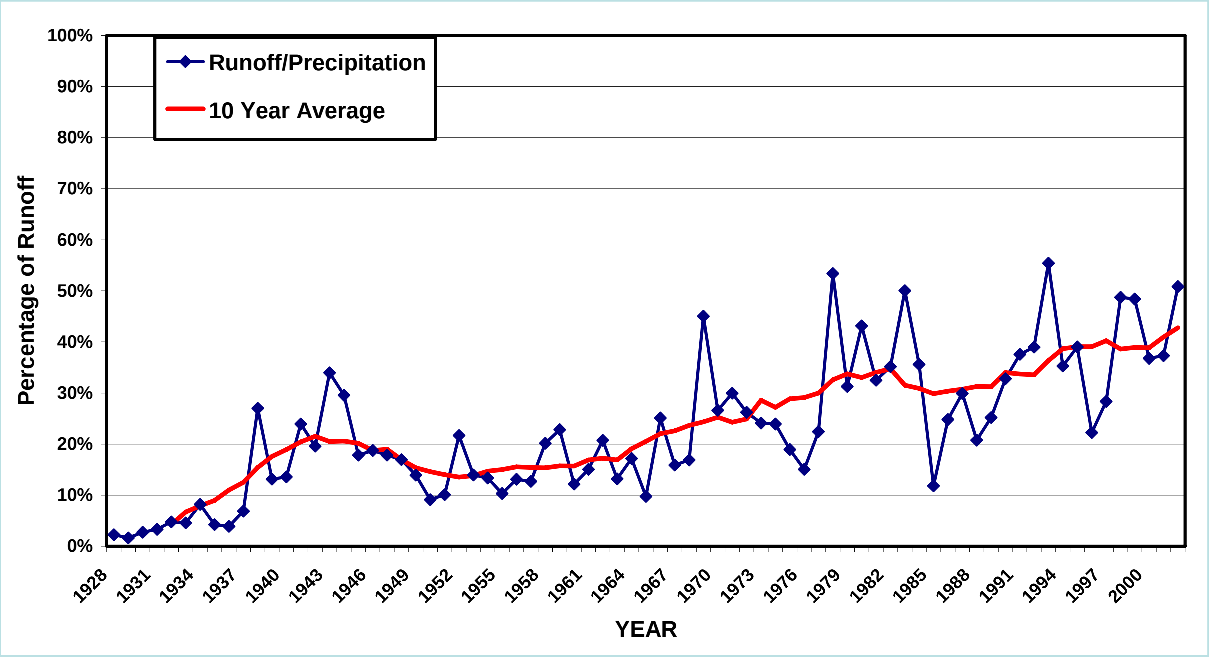
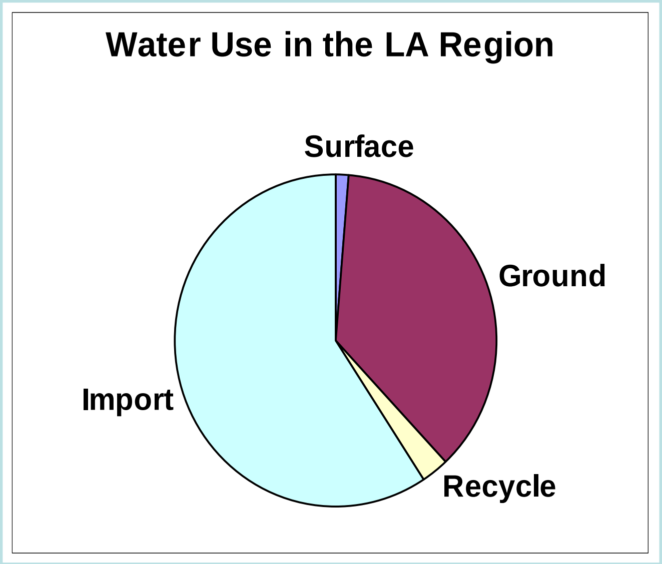
Los Angeles & San Gabriel Rivers Watershed Council

CHANGING HYDROLOGY In URBAN REGIONS



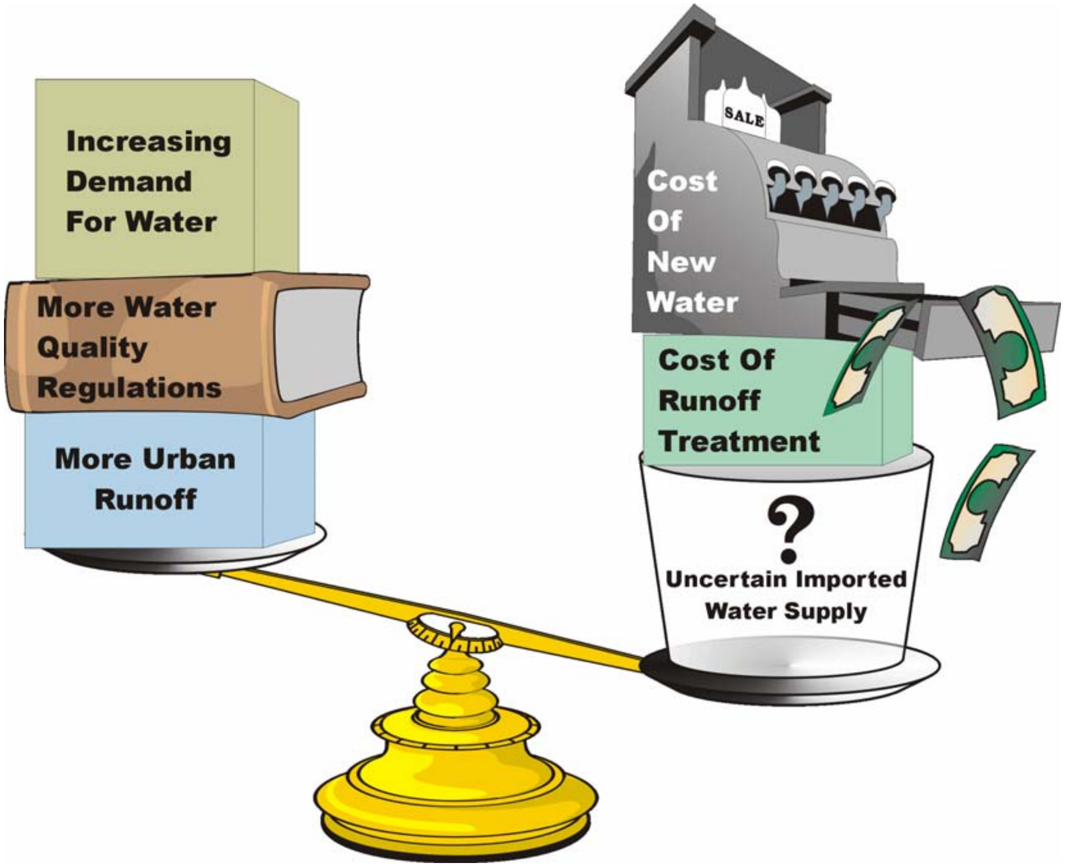


Water Augmentation Study Formation

Purpose: to explore the potential for increasing local water supplies, reducing flooding and surface pollution by capturing stormwater runoff for infiltration and groundwater recharge

Research Questions:

- Impact on groundwater quality
- Accessibility of recharged water
- Cost effectiveness
- Other potential benefits (social, environmental)



WAS Study Design

Initial Study (2000-01)

- Literature Review
- Preparation of Monitoring Plan

Phase I (2001-02)

- Pilot Study: investigation of the groundwater quality impacts of infiltrating storm water by monitoring two BMP sites

Phase II (2002-05)

- Additional sites, different land uses and site conditions, continued monitoring

Phase III (2003-2008)

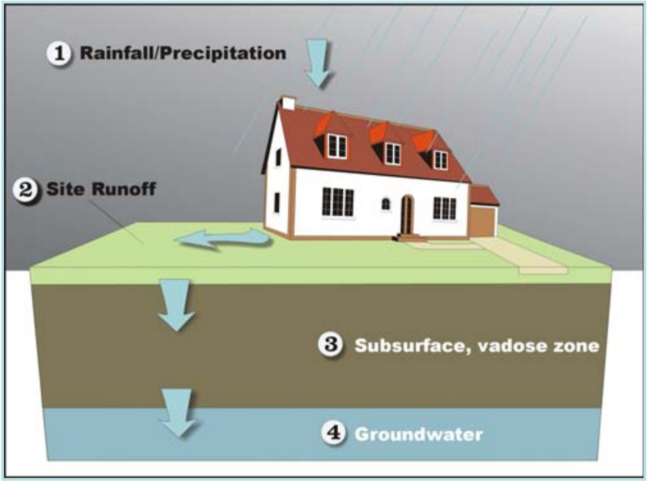
- Neighborhood-scale demonstration projects (retrofits)
- Regional runoff-infiltration model and cost-benefit model
- Assess feasibility of region-wide infiltration in terms of physical constraints, social and institutional issues and economic factors
- Develop a region-wide implementation plan to deploy infiltration strategies in appropriate locations and settings.

WAS Funding Partners

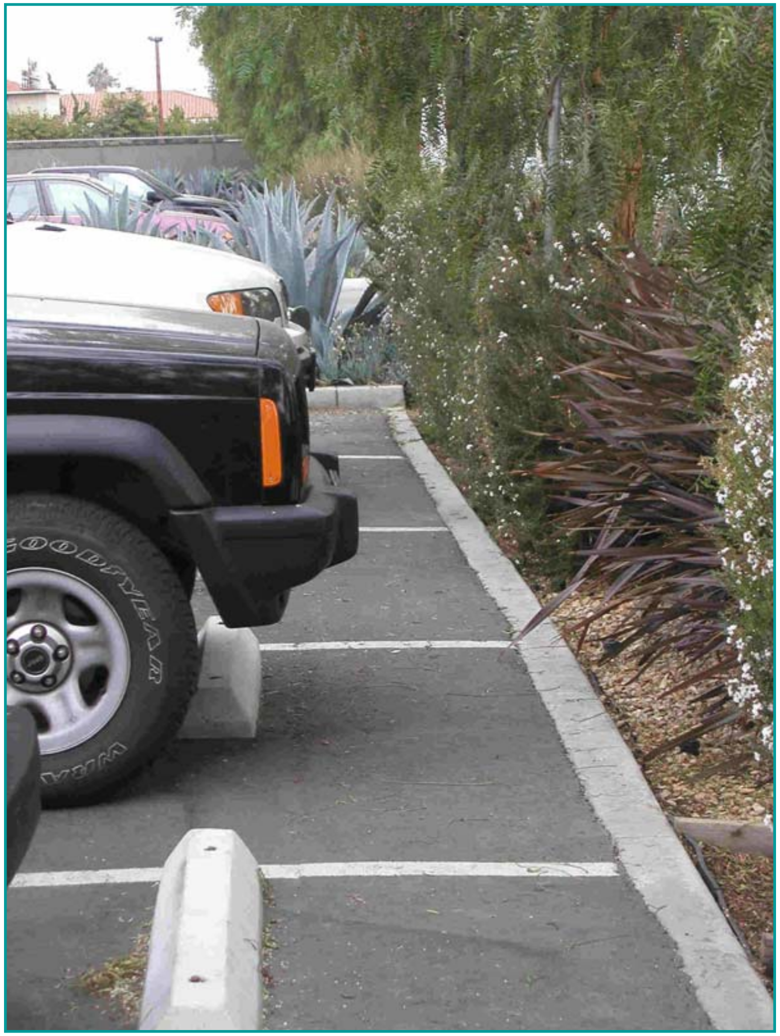
City of Los Angeles Department of Water & Power
City of Los Angeles Watershed Protection Division
City of Santa Monica Environmental Programs
County of Los Angeles Department of Public Works
Metropolitan Water District of Southern California
Regional Water Quality Control Board, LA Region
U S Bureau of Reclamation
Water Replenishment District of Southern California
State grants: Prop 13 SWRCB and CalFed

Phase I/II Monitoring Program

1. Constituent list developed by the Technical Advisory Committee to include common storm water pollutants and priority pollutants of concern in drinking water; revised annually based on results.
2. Two sites selected for monitoring during 2001-2002 season where infiltration facilities were newly installed (Phase I), new sites added 2002 and 2003 for a total of six: industrial, commercial, residential.
3. Installation of groundwater monitoring wells and soil water samplers (lysimeters) at all sites.
4. Baseline sampling of gw wells and soil.
5. Sampling plan: 3-4 storm events/season
   - **Sample site runoff during storm**
   - **Sample lysimeters and wells after infiltration**
   - **Monitor infiltration rates**



BMPs to CAPTURE STORMWATER RUNOFF for INFILTRATION



Monitoring Results to Date

No trends indicating that infiltration is negatively impacting groundwater

• Constituents of concern detected in stormwater include lead, arsenic, chromium VI, perchlorate, some organics. Concentrations in groundwater did not correspond to stormwater detections.

• Other constituents of concern for groundwater were not detected in stormwater: disinfection byproducts (NDMA), PAHs, 1,4-Dioxane and DBCP.

• Soil is efficient at removing bacteria; total and fecal coliforms and E. coli were detected in most stormwater samples, not in most lysimeter or groundwater samples.

Monitoring Results to Date, cont.

- VOCs detected in stormwater were routinely different than those detected in groundwater – no impacts detected from infiltration.

- Concentrations of metals tended to be higher in stormwater than in subsurface water samples. Concentrations in subsurface samples were generally stable or decreasing.

- Most inorganic groundwater quality constituents do not show clear trends or show decreasing concentrations over the study period.

Monitoring Results to Date, cont.

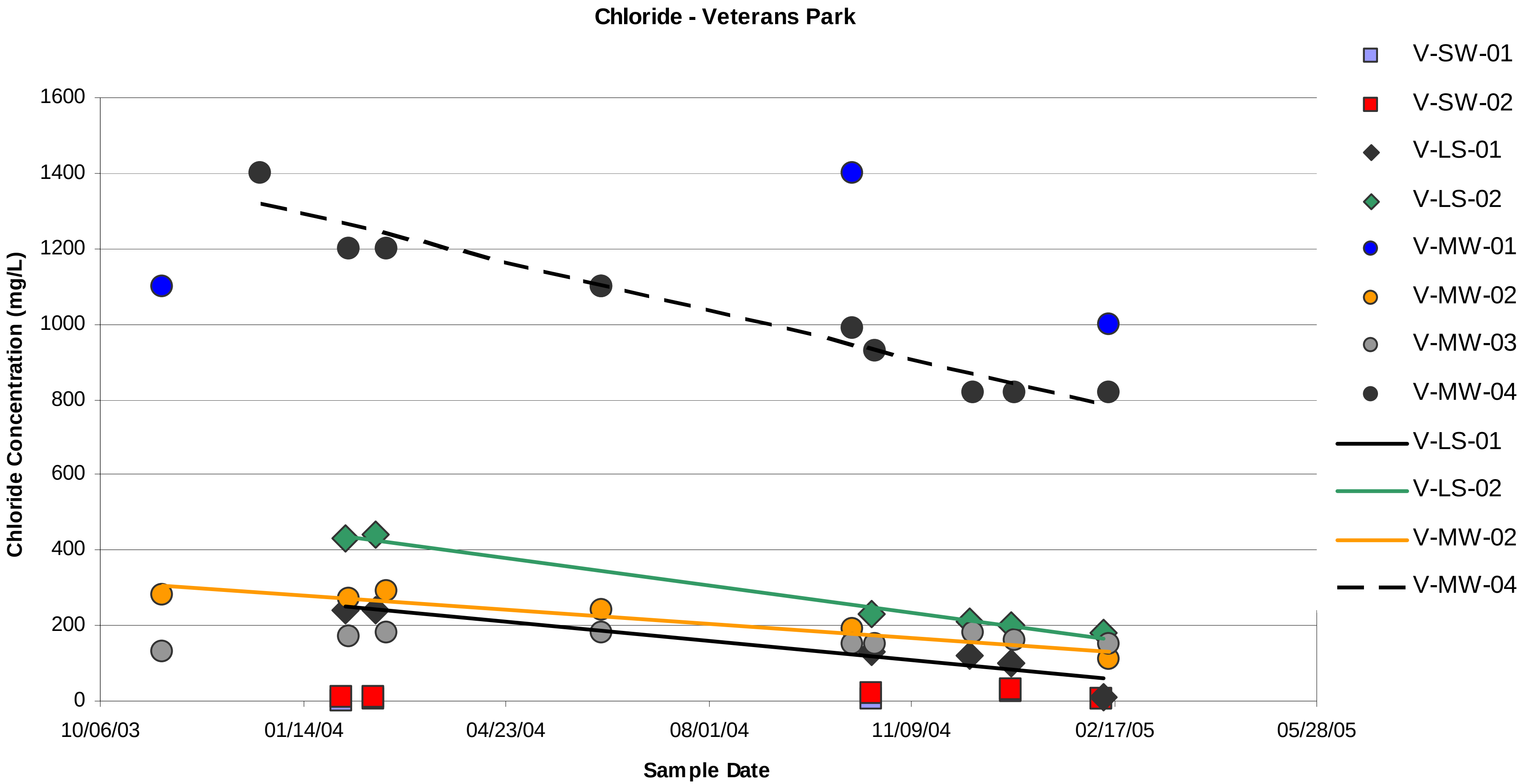
• Industrial sites: more organic compounds, higher concentrations of metals than the non-industrial sites. Filtration system in the detention basins was effective at reducing concentrations of some constituents, such as dissolved metals.

• Soil samples collected at the conclusion of the study indicated no significant increases in parameters monitored, in many cases constituent concentrations were reduced.

• Groundwater quality has generally improved for most constituents at sites with shallow groundwater.

Los Angeles River

Concentration Trends Over Time



Challenges

- Weather prediction and reality don’t always intersect.
- It doesn’t always rain when it’s convenient to sample.
- Lysimeters don’t always perform as advertised.
- Difficult to know whether subsurface sampling is reflective of surface inputs.
- Parcel-scale monitoring may be too small scale.
- Budget constrains how much sampling can be done and thus the statistical significance of results.
- Reporting the water quality data – compared to what?

Lessons Learned
(or… if I knew then what I know now)

- Consistent project management
- Consistent field crews and analytical laboratory
  - **Sampling protocols**
  - **Analytical methods, detection limits, QC**
- Monitoring methodology
  - **Flow meters to quantify infiltration volumes**
  - **Tracers studies or percolation tests**
  - **Design BMPs for automated samplers**
- BMP maintenance considerations

Next Steps: Phase III Program

1. Demonstration projects at a neighborhood scale, incorporating sustainable and low impact design strategies
   - **Reduce runoff volumes**
   - **Reduce impermeable surface area**
   - **Increase water conservation and reuse**
   - **Reduce outdoor water use**
   - **Habitat creation/restoration**
   - **Increase community awareness of watershed issues**

2. Monitoring Program at existing sites for long-term trends

3. Regional strategy for implementation
   - **Runoff-infiltration and economic models**
   - **Feasibility: geographic, geologic, economic, regulatory, which BMPs where, etc…**

Residential Retrofit Strategies

- Native landscaping to reduce water use and promote habitat
- Cisterns or rain barrels to capture runoff for irrigation
- Redirect roof downspouts into landscaping
- Dry wells, driveway drains, permeable paving for infiltration

Before

After

Neighborhood Retrofit to Address Runoff

Seattle Public Utilities natural drainage program: “Street Edge Alternatives”

- Swales to detain/infiltrate runoff
- Parking on one side, parking on the other
- Curvilinear street for traffic “calming”

After

Stream Restoration and New Parks

Brisee Ecology Park, Los Angeles

Before

After

Potential Retrofit Sites

For more information:

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http://www.lasgrwc.org/WAS.htm

San Gabriel River at Whittier Narrows